First Draft
July 1, 1986

ESO 1288

INTEGRATED COMPUTER/RADIO SATELLITE

GRAIN MARKETING RISK MANAGEMENT PROGRAM

By

E. Dean Baldwin and Darrel L. Acker

Proposed for the AAEA Annual Meeting
Reno, Nevada
July 27-30-1986

First Draft, 7-1-86

ESO 1288

Integrated Computer/Radio Satellite Grain Marketing Risk Management Program

By

E. Dean Baldwin and Darrel L. Acker

Introduction

Prior to the early 1980s, the Ohio Cooperative Extension grain marketing program was taught by a state specialist with assistance from county and district agents. A grain marketing teaching book, Suggested Teaching Materials - Grain Marketing in Ohio, was written in 1982 and was revised in 1983 and 1984. This book was used to train county extension agents who then used the teaching materials and aids to organize introductory grain marketing meetings and schools. The state extension specialist traveled to meeting sites to discuss intermediate level subject matter with farmers and agribusinessmen. The main topic for discussion was examining and comparing potential profits and losses for selected marketing strategies. Although the impact of production costs and food and feed grain policies on marketing decisions were an important part of the grain marketing curricula, the educational programs primarily emphasized marketing principles and concepts.

The need for complete integration of production costs, management principles, financial concepts and food and feed grain policy into the grain marketing extension curricula appeared with the emergence of the farm financial crisis. High interest rates, emphasis on cash flow loan repayment schedules, low grain prices, introduction of new marketing alternatives and significant changes in food and feed grain programs

---

Paper prepared for presentation in Symposium at the annual meetings of the American Agricultural Economics Association (AAEA), Reno, Nevada, July 27-30, 1986

required a broader yet more complex educational approach. It was no longer practical to treat production costs, management, marketing, finance or policy principles as unique, independent subjects. The principles from each needed to be integrated into one plan to help farmers make acceptable decisions.

Farmers needed in-depth training to understand and use new marketing alternatives such as commodity options. Specialized training was also required to understand the revised feed and food grain policies and to integrate these policies into a farm marketing plan. Further, specific training was required to understand the cash flow-oriented financial plans that were being developed by financial institutions. Finally, new marketing strategies, which incorporated and evaluated cash flow requirements and financial survival or financial growth objectives, were required.

General information on these integrated topics could be delivered to relatively large audiences. However, uncertainties in food and feed grain policies and corresponding changes in market outlook information and financial conditions required a continuous update. Furthermore, geographical dispersion of the audience required localized information and data. The diversity, extent and complexity of the information required a flexible delivery system. Finally, farmers needed data and decision aids to develop integrated production-financial-marketing-management plans for their specific farms.

At the same time that demand for a complex, more integrated extension education program was increasing, resources for extension education were declining. Travel budgets were reduced, publication budgets were

slashed and policies to decrease the number of faculty and staff members were instituted .

Both the increase in demand for an integrated marketing program and the declining extension resource base led to a pilot effort which combined micro computers, a radio satellite down-link system, teaching materials and video tapes. The remainder of this paper describes the pilot program, examines the educational benefits and costs, highlights limitations, documents the audience's perceived acceptance of the program and discusses the impacts of the program on the structure, performance and mission of the extension service.

Grain Marketing Risk Management Program

Sponsors

Farm Credit Services of Louisville, Kentucky co-sponsored the program with the Ohio Cooperative Extension Service. Invitations were mailed to farmers and agribusinessmen by county extension agents and PCA/FLB associations.

Grain Marketing Risk Management

Based on earlier work done by Anderson and Ikerd, a marketing risk management extension education program was developed for commercial grain producers. The ultimate objective was to teach farmers how to identify marketing alternatives and strategies that maximize their probabilities of financial survival, given actual market conditions.

Subject matter included grain market and price outlook, production costs, food and feed grain policies, general risk concepts, probability concepts, probability data for crop yields, prices and bases, marketing alternatives, strategies, and data. This information was integrated in a micro computer simulator that was designed to select the marketing

alternative that maximized the probabilities of financial survival. All subject matter, including references and overhead visuals, was published as a notebook, Grain Marketing Risk Management for Farmers and Agribusinessmen, and was used in in-service training classes for county extension agents.

Delivery Systems

To educate a relatively large audience at geographically dispersed locations and to eliminate travel costs for the extension state specialists, the program was broadcast weekly via a satellite radio network to eight locations in Ohio's major grain producing regions during January and February, 1986. Satellite radio down-link broadcasts, with WATS phone call-back communications for questions, occurred throughout a six-week period.

To update the information being broadcast, to regionalize the data for eight sites and to provide specific analysis for individual cash grain farms, a micro computer grain marketing-risk management simulator using Lotus 1-2-3 software, was written. The menu driven simulator was comprised of four integrated parts; three enterprise modes (corn, soybeans and wheat) and a farm risk model.

Each enterprise was modeled to determine the probable net return from the sale of grain to four elevators in three time periods for ten different marketing alternatives, including sale via the food and feed grain programs.

Based on localized prices, bases, marketing, costs, fnancial and yield data, users selected the optimum marketing alternative, elevator and time period for selling grain by examining net expected returns (total per acre revenue minus total variable production and marketing

costs). The farm risk model used the probable net returns output for the optimum marketing alternative for each enterprise as input to determine the short term and long run probable net farm returns (so that short term and long run cash flow obligations for the whole farm would be covered). An example of selected input and output for a hypothetical cash grain farm is presented in Table 1. A more complete discussion of the model and the data in Table 1 is found in an article, Using Risk Management Models in Extension Marketing Programs: A 1986 Crop Year Example, [Baldwin, Henderson and Lee].

To supplement the information broadcast via radio, video tapes developed by Farm Credit Services were also used in five of the six sessions. These tapes were used to review selected marketing subject matter including production costs, hedging, marketing alternatives and financial-marketing relationships [Farm Credit Services].

Coordination Among State and County Extension Faculty

State and district extension specialists with some assistance from Farm Credit Services authored the notebook, developed the micro computer marketing program and provided in-service training for the county agents.[1/] The multidisciplinary teaching team (agricultural economist, agronomist and a financial representative) consisted of state, district and county extension faculty of the Ohio Cooperative Extension Service, and a staff person from Farm Credit Services. The teaching team broadcast the program via radio from Columbus, Ohio to the eight county sites.

Approximately two and one half hours of broadcast time occurred during each of the six sessions. A sportscaster's approach was used, i.e., an announcer and a color commentator. At each site, county agents

distributed the notebooks to clientele, conducted homework, review and discussion sessions, operated the micro computer program, played the video tapes and coordinated details. County agents utilized approximately one and one half hours per session to perform their teaching functions.

Since a notebook was provided to each student and all visuals (overhead transparencies) were available at each site, the radio teaching team member would identify the appropriate visual, the county agent would project the visual on the screen at the local site and then the teacher discussed the material.

Preliminary Results[2/]

To examine educational benefits, economic costs, limitations, audience acceptance of the program, and to assess the program's impact on structure, performance and mission of the extension service, participants completed a true and false subject matter quiz and a program evaluation survey.[3/] For the survey, each respondent was asked to evaluate each statement on a scale of one to five, with five equally strongly agree and one equally strongly disagree. Approximately 120 evaluations were returned and are included as part of this discussion.

Although a control group which received on-site grain marketing risk management instruction (traditional teaching approach) was not available for comparative purposes, comparisions are made based on assumptions and on our previous experiences with traditional programming.

Educational Benefits: Pilot Versus Traditional Programming

Benefits are herein defined as knowledge learned by students and county agents. Based on quiz averages and standard deviations, the

pilot program directly benefited students. The average score on the quiz was 84% with a standard deviation of 6.6%. In addition, the average ranking by students for the statement, "I learned new information from this program," was 4.1 on the five point scale. The standard deviation was only 0.5; thus, 67% of all respondents indicated that they had received a significant increase in knowledge (4.6 to 3.6). Further, 74% of all respondents reported that the pilot effort would change their marketing practices and 80% indicated that the effort would improve their cash flow and potential net returns from crop enterprises. Finally, county agents reported that the average weekly attendance rate for the pilot program equaled the rate for prior traditional programs.

An additional indicator of knowledge learned by students is the planned change in the selection and new use of information to make marketing decisions (Table 2). A significant proportion of the students indicated that they were planning new or increased use of information. For example, 50 percent of all respondents indicated that in the future, they would maintain and monitor expected prices for commodities (crops).

Student evaluations of teaching performance by county extension agents were one measure of knowledge learned by agents. Students perceived that agents were well trained and knowledgeable. The average rating for the statement, "The county agents (local presenters) were well organized and knowledgeable," was 4.3 with a standard deviation of .36. County agents reported that they learned new information from the program, would use the overheads and visuals in future educational efforts and were currently organizing marketing clubs around the grain marketing risk management simulator program.

Based on these findings and our prior experience from evaluating traditional programs, it appears that the benefits received from the pilot effort are at least equal to what would have been received from traditional programming for students. It is our perception that more knowledge was gained by county agents than would have been gained in a traditional program because they received in-service training, a complete set of visuals and were an important part of the teaching team.

Costs: Pilot Effort Verses Traditional Programming

Cost estimates for the pilot effort were based on expenditures and explicit assumptions. Cost estimates for the hypothetical traditional program were based on the following assumptions: an agenda identical to that for the pilot effort was followed, notebooks, video tapes and the simulator were made available to audience members and training was personally conducted by a three-member teaching team at each of the eight sites. The cost per student is based on the assumption that 250 persons were in attendance for the pilot effort and for the hypothetical traditional program.

For the pilot effort, variable cost for the radio broadcast equaled $4.00 per minute, $520 per session, or $3,120 for six sessions. A $300 monthly fixed charge was also paid to the radio broadcasting company. Monthly fixed and average variable costs equaling $70 and $150, respectively, were paid to the telephone company for the two WATS lines. Although Farm Credit Services subsidized the video tapes, the rental fee for each tape would have been $10 per showing, $80 for the eight meeting sites, or $400 for five sessions. Total radio, telephone and video tape costs (communication costs) equaled $4,564 or $18.26 per student.[4/]

To conduct the pilot program, it was assumed that additional preparation time was required to coordinate the effort (three persons x 40 hours x $16/hour equals $1,920). Further, additional personnel were involved at the broadcast site in Columbus to operate the radio controls and to answer telephones (two personnel x 19 hours x $16/hour equals $576). Agent orientation was also required. It was assumed that three agents were located at each broadcast county site and that four hours of training occurred via radio (Personnel, radio and phone costs were estimated to equal $4,000).[5/] These additional costs equaled approximately $6,500.

To print the notebooks for all students and to provide meeting sites cost $8,750 or $35 per student. Total cost for the pilot effort equaled approximately $20,000; $80 per student, $13.33 per student-session or approximately $0.55 per student contact hour.

For the hypothetical traditional program, it was assumed that the same notebooks and video tapes would be included as part of the program costing $9,150. To have a three member team travel to 48 meetings would cost $11,376 (48 trips x 150 miles/trip x $0.20/mile plus 3 meals x $5.00/meal equals $2,160; opportunity cost of travel time equals 4 hours/trip x 48 trips x 3 personnel x $16/hour equals $9,216). Total cost for the traditional program also equaled approximately $20,000 or $0.55 per student contact hour.

Therefore, the cost for the traditional program equaled the cost for the pilot effort. This finding is based on the assumption that the program was delivered to only eight sites and 250 students. If the program were delivered to more sites and more students, travel and personnel opportunity costs for the traditional programming method would

increase proportionately while broadcasting cost for the pilot effort would change little. Therefore, economies of scale would decrease the cost for the pilot effort relative to a traditional program.

Audience Acceptance of Communication Delivery System

The acceptance of the communication delivery system by students is reported in Table 3. Most program components received an above average rating. The exception was the response to the statement, "I know how to use the computer model". Although output from the computer model was a very important part of the program, audience members did not have adequate opportunity, or did not invest a sufficient amount of time, to learn how to use the simulator.

Limitations of Pilot Effort

Limitations or new constraints that appeared as a result of the pilot effort are based on personal observations or from personal accounts by county agents. Audience members who responded to the survey did not identify any significant limitations.

To successfully present this pilot effort required additional planning and coordination relative to that expended for a traditional program. Secondly, all materials had to be prepared in advance of the first meeting in order to train county agents and to mail the notebooks to each of the eight sites. Since it was difficult to estimate the audience's initial understanding of the subject matter, this created some difficulty. For example, it was believed that audience members would have difficulty understanding probability concepts; therefore, repetitive examples were provided in the notebook. After the second

session, we were advised by county agents that too much time was being spent on these examples. It was difficult to adjust the agenda because all information had been published.

The breadth of the subject matter and the use of the radio communication system required a team teaching approach. Audience members indicated that it helped concentrate on the subject matter when more than one person was broadcasting. The change in the tone of the voice, different vocabularies and explanation methods helped to maintain the audience's attention span.

Impact of Pilot Program on Structure, Performance and Mission of Extension Service

A. **Development and Release of Usable Prototypes**

The micro computer grain marketing risk management simulator meets the criteria of being relatively inexpensive and accessible to clientele through the county extension office. Further, it is a powerful decision making tool which can be used by individuals or groups. A major investment in personnel time and computer equipment is required to teach audience members how to use the simulator. The marketing club format is one method for achieving this investment.

B. **Procedure and Methods for Regional Cooperation**

The micro computer simulator and the risk management teaching materials were based on pioneering work of Anderson and Ikerd. We believe that the current simulator has potential for use throughout the Midwest. Preliminary discussion with Dr. Uhrig suggests that the integration of his artificial intelligence

grain marketing system with the risk management system shows promise [Uhrig]. Video tapes that are prepared by other professionals can be used successfully. Finally, the radio down-link system can and should be used to share expertise across state boundaries. A teaching team from several different state institutions could be organized and coordinated to deliver a marketing program.

C. Funding Prospects for Development and Delivery of New Programs and Interaction With the Private Sector

A relatively small part of the Extension budget was used to develop and deliver this pilot effort. Audience members in Ohio were willing to pay registration fees to support quality programming. Further, the private sector appears to be willing to support these efforts. The cooperation from the Farm Credit Services of Louisville, Kentucky was excellent. Some grain elevators and merchandisers are currently experimenting with the simulator as they interact with their customers, a necessary condition to encourage farmers to use new models and programs on a daily basis.

D. Role and Need for Extension Staff

This experience suggests that state specialists will be substituting preparation, development and coordination time for travel time. Further, there is a need for an increase in technological and program development and coordination skills that should and must be provided by support staff. County agents will be an important part of the teaching team; there-

fore, they must provide input throughout all phases of the program. Further, the program must be diverse and must meet the regional demands of a geographically dispersed audience.

Conclusions and Implications

A joint radio down-link, telephone, computer and video communication system was used to broadcast a grain marketing-risk management extension education program to eight county locations in Ohio. Based on a subject matter quiz, student evaluations of the program and personal observations, the preliminary results from this pilot effort were relatively consistent with the proposed findings for "Teleconferencing" and "Computer Networks" in the USDA Task Force Report, Electronic Technology-Impact on Extension Delivery Systems.

For example, a complex subject matter including a problem solving framework was effectively taught at multiple sites with reduced specialists' travel. Subject matter was taught in a timely manner, was updated as conditions warranted and was varied among locations to capture geographical differences. The addition of micro computers and program disks at county offices increased the potential for problem solving. Increased training of county agents, advanced preparation and computer and radio technical support were required.

For the pilot effort, total costs were not reduced relative to a hypothetical grain marketing-risk management program delivered by the traditional method. However, the pilot effort transferred expenditures from state specialists' travel and travel time to in-service training for county extension agents, resulting in a major improvement in educational benefits. These benefits would be maintained and costs for the pilot effort would decline relative to the traditional program as the

number of sites receiving the broadcast and the size of the audience were increased. Therefore, the conclusions reached by USDA that costs would decline with a form of teleconferencing and computer methods is supported by the findings from this pilot effort.

Benefits include an additional investment in training for county staff. Since county agents are using this training, supporting information and the micro simulator to conduct marketing classes, organize marketing clubs, and advise farmers, a secondary spin-off effect exists. Further, the students' learning process does not appear to be impeded by the non-traditional delivery method. Therefore, it is concluded that total educational benefits from the pilot effort are increased relative to those received from the traditional program. Other benefits include a format for continued update of information, ability to integrate marketing procedures, finance and risk management concepts into one program, the ability to efficiently use an interdisciplinary teaching team, and the flexibility to use resources from the private sector.

New limitations or constraints include increased lead time, improved coordination among staff, investment in new equipment at sending and receiving sites, new expertise in technology as provided by support staff and an increased need for data banks to effectively use the micro computer simulator. Based on this pilot effort, these constraints do not appear to be overly restrictive or costly. Lack of acceptance of the new delivery system by the audience, inability to hold the audience's attention, and limited interaction constraints as suggested by the USDA task force report cannot be supported by the findings from this pilot effort.

In the long term, the non-traditional delivery system would constrain personal contact between state extension specialists and members of the audience. This could be a major limitation and may prevent the complete introduction of this type of delivery system. In this pilot effort, the consequences, if any, of this long term effort have not been analyzed.

Footnotes

1/ The marketing program was written by Mr. James Dayton, Computer Assisted Instruction Specialist, Ohio Cooperative Extension Service, The Ohio State University.

2/ Follow-up evaluations are in progress to evaluate whether students actually changed their marketing habits.

3/ Since a pre-test was not administered, improvements in the level of knowledge could not be measured.

4/ The delivery system was used to deliver other radio programs. By including all fixed costs as part of the total costs for the grain marketing risk management program, total costs have been overstated.

5/ This is an assumption. Because the radio system was not in place, county agents traveled to Columbus to receive in-service training.

References

Anderson, Kim and John Ikerd. Risk Rated Management Strategies for Farm and Ranch Decisions, Oklahoma Extension Circular E-841, Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma.

Baldwin, E. Dean, Dennis R. Henderson and Warren F. Lee. "Using Risk Management Models in Extension Marketing Programs: A 1986 Crop Year Example," Paper presented at 1986 AAEA meetings, Reno, Nevada, July 27-30, 1986.

Baldwin, E. Dean, Darrel L. Acker, Dennis Henderson, Robert Fleming, Warren Lee, and Walter Schmidt. Grain Marketing Risk Management for Farmers and Agribusinessmen, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio, 1986.

Baldwin, E. Dean, Darrel L. Acker, Carl Ruff, Dan Cowdrey, Robert Fleming and Walter Schmidt. "Suggested Teaching Materials: Grain Marketing in Ohio," Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio, 1982, 1983 and 1984.

Farm Credit Services, "Agricultural Commodity Marketing Facilitators Guide," Louisville, Kentucky, October 1985.

Uhrig, William. "Use of Artificial Intelligence Systems in Grain Marketing", Paper presented at organized Symposia, AAEA Meetings, Reno, Nevada, July 27-30, 1986.

USDA. Electronic Technology-Impact on Extension Delivery Systems, Washington, D.C., May 1985, pp. 7-8.

Table 1: Selected Input and Output Data for a Hypothetical Cash Grain Farm, A Case Study for the Eastern Cornbelt

Selected Input and Output Data for Three Enterprises

	C O R N				S O Y B E A N S				W H E A T			
	INPUT		OUTPUT		INPUT		OUTPUT		INPUT		OUTPUT	
Time Periods	Harv.	Mar. 87			Harv.	Mar. 87			Harv.	Dec. 86		
Government Program Decision			Non Partic.	Partic.			Non Partic.	Partic.			Non Partic.	Partic.
TVC $/Bu.												
Non Gov't Partic.	1.33	1.33			2.70	2.70			1.82	1.82		
Gov't Participation	1.38	1.38			2.70	2.70			1.98	1.98		
Price $/Bu.												
Forecast Harvest	2.15				5.00				2.44			
Foreward Contract		2.40				5.35				2.64		
Futures		2.34				5.50				2.84		
Basis Contract Basis		-0.25				-0.22				-0.20		
Delayed Price Charge	0.03	0.05			0.10	0.16			0.10	0.25		
Historic Basis	-0.30	-0.16			-0.40	-0.10			-0.30	-0.05		
Mktg. Alternative			FC	FC			BC	BC			Hedge	Hedge
Time Period			Mar. 87	Mar. 87			Jan. 87	Jan. 87			Dec. 86	Dec. 86
Price$/Bu			2.4	3.05			5.2	5.2			2.79	4.4
Net Ret. $/Bu.			0.81	1.48			2.32	3.32			0.53	2.05
Net Ret. $/Ac.												
Optimistic			155	250			136	136			50	133
Expected			97	177			93	93			24	92
Pessimistic			40	104			50	50			- 2	51
Prob. TR>TVC (%)			96	99			98	98			82	99

Selected Output Data for the Hypothetical Farm Firm

	SHORT TERM						LONG TERM					
Cash Flow Requirements	($64,000 Low)		($208,000 Medium)		($344,000 High)		($74,000 Low)		($218,000 Medium)		($354,000 High)	
Government Program Decision	Partic.	Non Partic.	Partic.	Non Partic.	Partic.	Non Partic.	Partic.	Non Partic.	Partic.	Non Partic.	Partic.	Non Partic.
Net Returns ($000)												
Optimistic	219	114	75	- 30	- 61	- 166	209	104	65	- 40	- 71	- 176
Expected	133	50	- 10	- 94	- 147	- 230	123	40	- 20	- 104	- 156	- 240
Pessimistic	48	- 14	- 96	- 158	- 232	- 294	38	- 24	- 106	- 168	- 242	- 340
Prob. TR>TVC+CF (%)	95	79	46	7	4	> 1	92	73	42	5	4	> 1

Source: Baldwin, Henderson, and Lee

Table 2: Percentage of Respondents Who Planned to Assemble and Use Selected Marketing Information not Maintained as Part of Prior Data Bank

Marketing Information	Percent Planning New or Increased Use of Information
To determine historic crop yields	22%
To determine expected crop yields	34%
To assemble and/or use basis information	44%
To generate data from computer simulator	44%
To determine expected prices for crops	50%
To assemble production cost data	19%
To assemble short-term cash flow data	37%
To assemble long-term cash flow data	42%

Source: Survey Results from Grain Marketing Risk Management Program

Table 3: The Acceptance of the Communication Delivery System[1/] as Reported by Audience Members: A Mean Score of Five Indicated Strongly Agree While One Indicated Strongly Disagree

Program Components	Mean Score	SD[2/]
The pilot Communication Delivery System (CDS) was an effective way to learn	3.95	.39
The CDS method is as good as the traditional approach (instructor present).	3.3	.47
In the future, I would attend other programs taught by CDS.	4.2	.41
The subject matter was well organized.	3.9	.28
The county agents (local presenters) were well organized and knowledgeable.	4.3	.36
My questions were satisfactorily answered.	3.9	.30
The video tapes provided useful information.	3.9	.23
The information generated by the computer models was useful for making decisions.	3.4	.27
I know how to use the computer models.	2.6	.41

1/ Communication systems is defined as a combined radio downlink-video tape-computer simulator network.

2/ SD equals standard deviation.

Source: Survey Results from Grain Marketing Risk Management Program.